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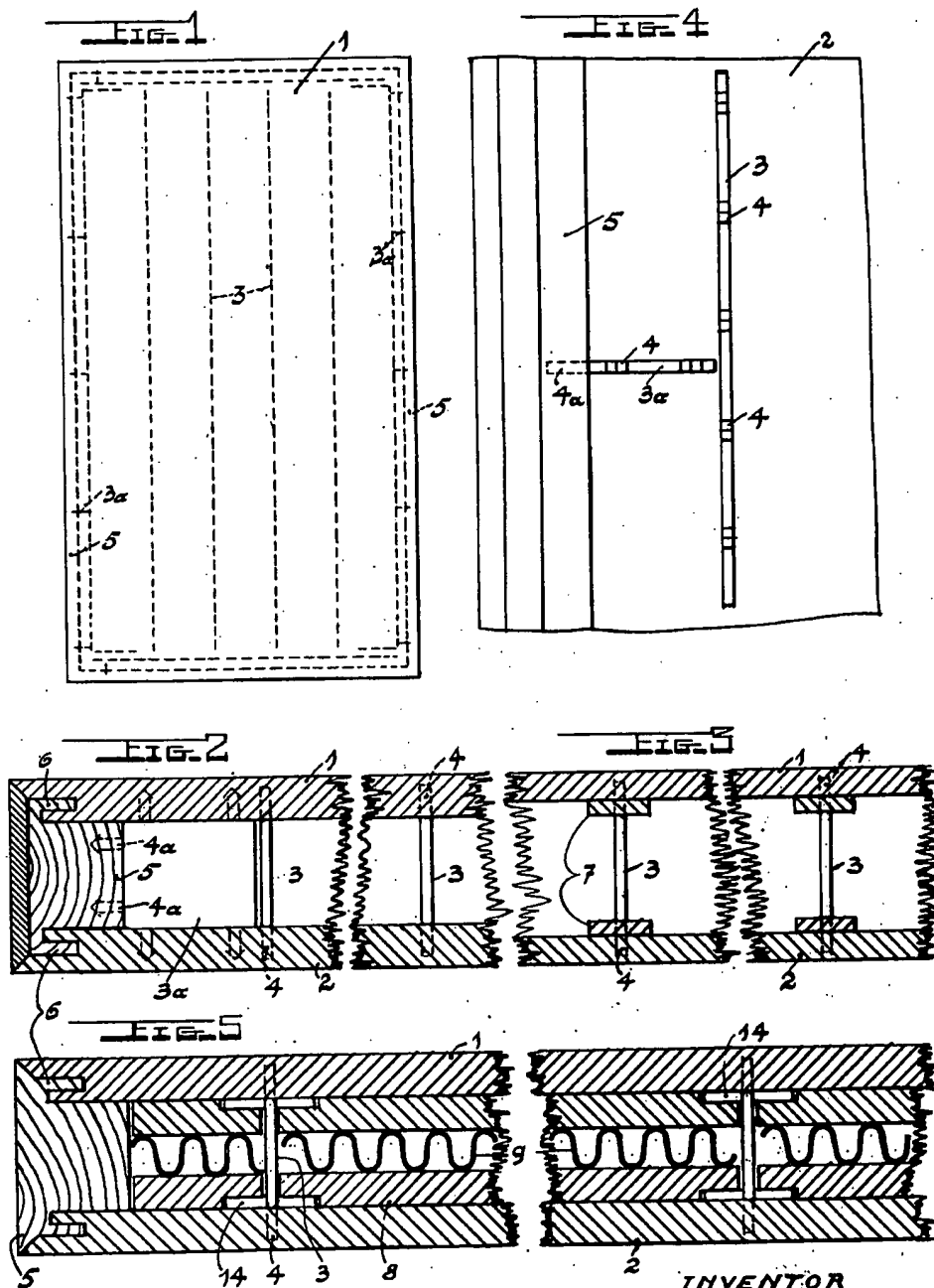
J. B. EEN

2,399,666

REINFORCED DOOR OF WOOD AND/OR INSULATION MATERIAL

Filed Oct. 23, 1940

3 Sheets-Sheet 1



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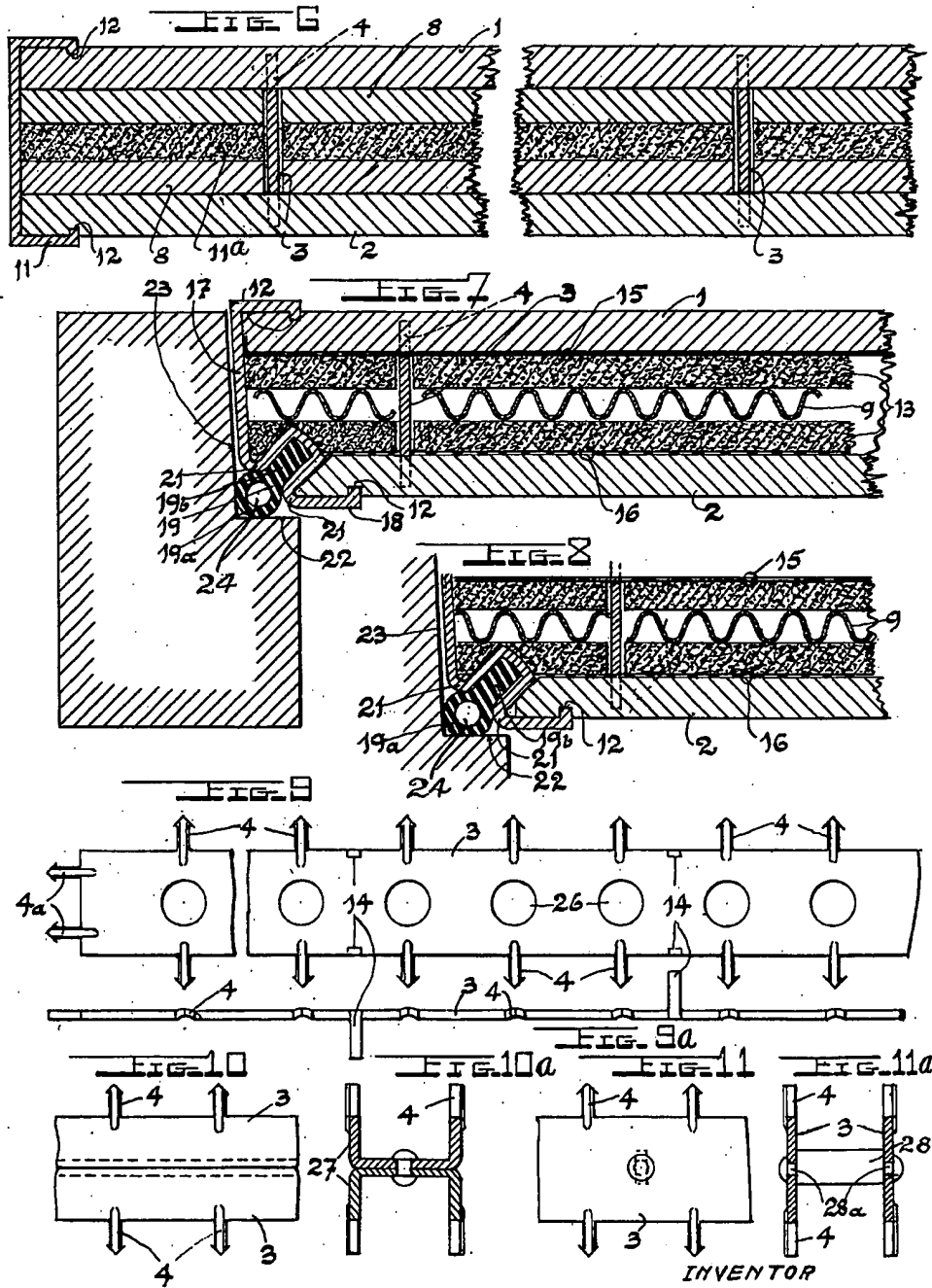
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REINFORCED DOOR OF WOOD AND/OR INSULATION MATERIAL

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3 Sheets-Sheet 2



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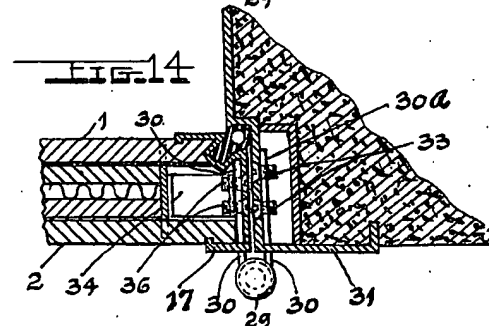
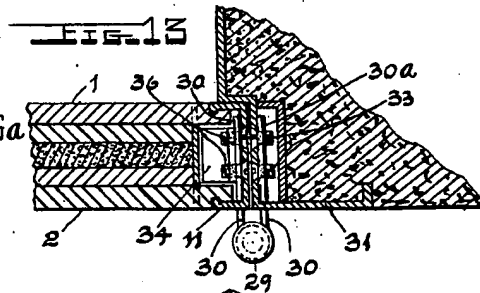
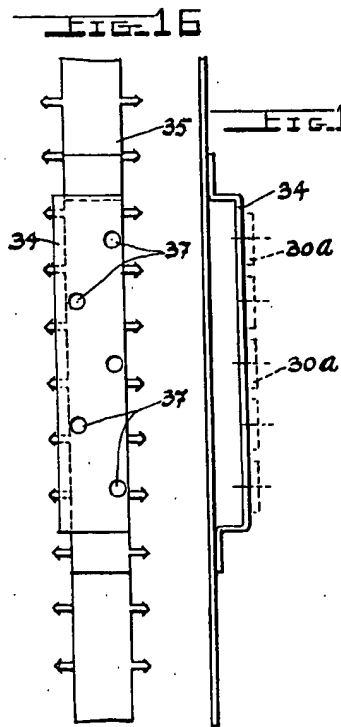
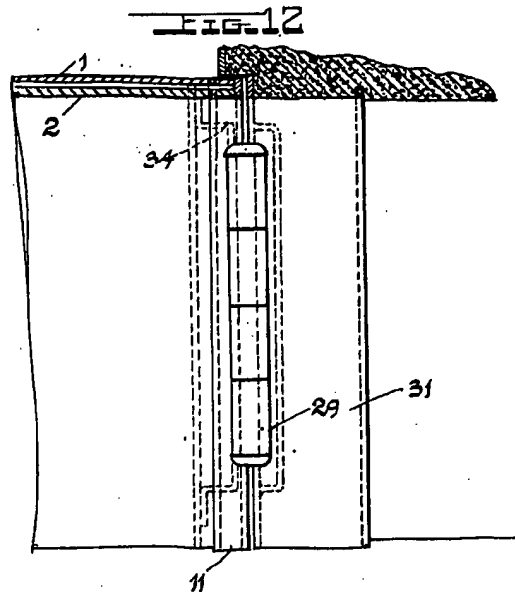
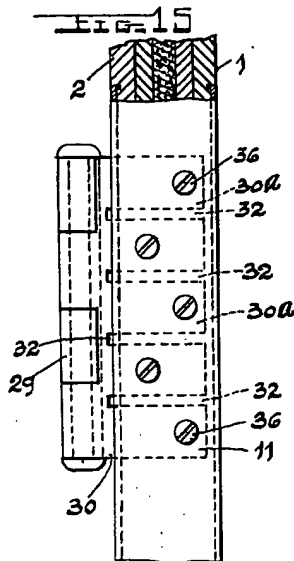
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REINFORCED DOOR OF WOOD AND/OR INSULATION MATERIAL

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,399,666

REINFORCED DOOR OF WOOD AND/OR INSULATING MATERIAL

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Application October 23, 1940, Serial No. 362,468
In Norway August 2, 1939

9 Claims. (Cl. 20—35)

The present invention relates to an improved reinforced door constructed of wood and/or insulating material.

The primary object of the invention is to provide a door which is made of panels of veneer or the like, with reinforcing bars between the panels, instead of the usual intermediate layer of wood or the like material, by means of which the panels are connected to each other, and whereby the door is given the necessary rigidity. Besides connecting the panels to each other, the reinforcing bars hold the panels at the proper distance from each other so that the door has desired thickness, strength, and resistance to torsion.

A further object of the invention is the arranging of insulating plates between the panels and between the reinforcing bars, which insulating plates may be covered with metal plates and be effective to insulate against heat, cold, and sound. Between these plates may be arranged a fireproofing plate, or another fireproofing material may be interlaid therebetween, whereby besides being heat, cold, and sound proof, the door will also be fireproof. The fireproof material may be arranged next to the panels, with or without waveboard or the like as an intermediate layer.

Further features of the invention include a special form of gas-tight seal, a special door hinge, and some novel details as the construction of the reinforcing bars, etc., which are described below.

In the accompanying drawings various forms of the invention are shown by way of non-limitative example:

Figure 1 is an elevation of a door according to the invention, on a small scale, with broken lines showing an arrangement of the reinforcing bars in the door.

Figure 2 is an enlarged fragmentary section through the edge of the door.

Figure 3 shows a similar section through another form of the door, formed of thin veneer panels having glued or otherwise secured to the inner sides thereof ribs of wood or other suitable material providing anchorage for the teeth on the reinforcing bars.

Figure 4 is a fragmentary elevation of the door with the front panel removed to show the arrangement of the reinforcing bars adjacent to the edge of the door.

Figure 5 is a view similar to Figure 2, showing insulating plates arranged between the reinforcing bars and between the door panels.

Figure 6 is a view similar to Figure 5, but showing a fireproof plate or body of fireproofing material placed between the insulating plates, and showing a metal edging for the door.

Figure 7 shows a door according to the invention with fireproof insulating plates at the inner

sides of the panels, and sheet iron or iron netting positioned between the panels and the insulating plates, and with an edging of metal, in which a wedge shaped shank equipped seal for gas-tight closing of the door is arranged.

Figure 8 shows a modified fastening of the edging, incorporating a seal, having a shank with parallel sides.

Figures 9 and 9a, show side or plan and edge views, respectively, of one of the reinforcing bars.

Figures 10 and 10a show side and cross sectional views of a dual reinforcing bar.

Figures 11 and 11a show similar views of another form of dual reinforcing bar.

Figure 12 is a front view of a hinge for doors having edgings of metal.

Figure 13 shows a horizontal cross section taken through the hinge of a door with edging of metal without a seal.

Figure 14 is a view similar to Figure 13 but showing the edging equipped with a seal.

Figure 15 is an edge view of the door with metal edging and showing the arrangement of the hinge leaf behind the edging, divided portions of the hinge leaf being shown in dotted lines, and,

Figure 16 shows a fastening iron for the hinge, which is secured to the reinforcing bar which lies nearest to the edging.

Figure 16a is a side or edge elevation of Figure 16.

The panels 1 and 2 of veneer or other suitable material are mutually firmly connected to each other and spaced at a suitable distance from each other by means of reinforcing bars 3, which along their edges are formed with teeth 4 which are embedded in the panels 1 and 2. The width of the reinforcing bars 3 is determined by the desired spacing of the panels 1 and 2, and the thickness of the bars is determined by the stiffness of reinforcement and strength of the teeth 4 desired.

The simplest and lightest-weight form of door according to the invention is shown in Figures 2 and 3, which show the door formed of two panels 1 and 2, with the necessary number of reinforcing bars 3 including one positioned along the inner edge of the door rail 5 which covers the panel edges and enters the space between the panels. This rail is provided to hold the edges of the panels firmly and it is formed with ribs 6 on each side, which are pressed into corresponding grooves in the edges of the panels. In Figure 2 is also indicated how the rail 5 may be connected to the panels by means of small reinforcing bars 3a, which have teeth at their side edges, and at one end to be anchored in the rail 5.

In the embodiment shown in Figure 3 the panels 1 and 2 are too thin to afford the necessary anchoring for the teeth on the reinforcing bars, since these must not project outside the panels. Therefore ribs 7 are provided on the inner sides

of the panels and are secured thereto with glue or by some other suitable means, the ribs being of wood or other suitable material for anchoring the teeth 4 on the reinforcing bars 3.

In the arrangement shown in Figure 5, insulation plates 8, providing insulation against heat, cold, and sound are arranged against the inner sides of the panels, between the reinforcing bars. These plates are put in place before the rails 8 and edgings are placed on the door, and a plate 9 of waveboard or the like is placed between the insulating plates 8 to hold them pressed against the inner surfaces of the panels 1 and 2.

In the form shown in Figure 6 there is placed between the insulating plates 8 an additional fireproof plate or body of fireproof material, so that the panels will be fireproof insulated from each other. In this figure is shown an edging or rail covering 11 of metal, whose sides are bent at right angles and cover the edges of the panels 1 and 2, and have edges 12 bent at right angles, which are pressed into grooves formed in the outer sides of the panels 1 and 2, whereby the edging or rail covering is fastened to the edge of the door without the use of screws or other special fastening means.

In the form shown in Figure 7 there are arranged fireproof insulating plates 13 at the inner sides of the panels 1 and 2, between which plates 13 is arranged an intermediate layer of waveboard or the like. To hold the insulating plates 13 in position even if one of the panels should be destroyed by fire, there are arranged hooks or lateral projections 14 (see Figures 5 and 9) on the reinforcing bars, or instead a thin iron plate 15 may be positioned between the panels and the insulating plates. This iron plate 15 is selected thin enough so that the teeth of the reinforcing can be pressed through the plate 15 and into the material of the panels. Instead of an iron plate there may be used a preferably fine meshed netting 16 between the panels and the insulating plates.

The metal edging or rail covering 17 is formed with an enlarged reentrant groove 18 at one corner wherein is arranged a tightening seal 19 of rubber or other elastic material. This tightening seal 19 is formed with a tubular part 19a and integral therewith is a flange-portion 19b which is thinnest next to the tubular part and thickest at its other end, whereby it is snugly anchored between the converging walls of the groove. For sealing purposes the rubber seal is so formed that a sealing part 21 lies against the edges of the groove 18. The groove 18 and the flange portion 19b may also be formed with parallel sides, as indicated in Figure 8, and in that case both parts are formed with grooves running longitudinally thereof or with other roughening to hold the flange portion of the seal in the groove.

The sealing part 19a of the seal is tubular and in accordance with the invention so arranged that, when the door is closed, it engages first, one side thereof against the door jamb 22 and is thereby bent over into engagement with the door post 23, so that there then exist two sealing surfaces arranged at 90° with respect to each other, with an air channel 24 in the corner between the door jamb 22 and the door post 23. When the pressure against the door jamb ceases or is relieved, the pressure against the door post is also relieved or ceases, and the door is free to be opened and reclosed.

The simple reinforcing bar 3, shown in Figure 9, is stamped out of sheet material and formed

with spearpoint-shaped teeth 4, whose strength is increased by bending them at an angle. Reinforcing bars for doors with fireproof insulating plates may be formed with the hooks or lateral projections 14, consisting of separate teeth, stamped out of the bar material and bent at a right angle to the plane of the bar. These hook like arrangements will hold the insulating plates in position, even if one of the panels should be consumed by fire. To prevent the conduction from one edge of the bar to the other of heat at ignition temperature, there are stamped out between each transverse pair of teeth a hole 26 located in the middle of the bar.

In special cases it may be effective to use dual or compound reinforcing bars, such as shown in Figures 10, 10a and 11, 11a, wherein are shown a dual reinforcing bar 27 composed of two bars with a U-shaped cross section with toothed edges and the backs of the bars firmly connected to each other; and a dual reinforcing bar comprising two single bars of the type shown in Figure 8, connected to each other by connecting pieces 28 with tabs 28a, which are securely riveted to the bars 3.

Where door edgings of wood are used, as in Figures 2 and 5, it is important that the edgings be securely connected with the panels. For this purpose the reinforcing bars may be formed on their ends with extra teeth 4a to be pressed into the wood of the edgings. The reinforcing bars in that case must be so arranged that the teeth 4a are exactly in position to be pressed into the edgings when these are put on the door.

Near edges of the door where normally no reinforcing bars terminate, short pieces 3a of reinforcing bars may be provided, with extra teeth 4a directed toward the edgings, as in Figure 2.

The reinforcing of the door may be accomplished with whole reinforcing bars, or with longer or shorter pieces of reinforcing bar. The reinforcing bars may also be bent in any suitable geometrical form, and the construction of details may, of course, be varied.

In Figures 12 to 16 are shown hinges for a door with edging of metal comprising a steel case, with the hinge leaves 30 of the hinges arranged inside both the edging 11 and the steel case 31, the hinge leaves 30 having horizontal slits 32 dividing them into, for example, five parts 30a, which are inserted through slits in the outwardly bent flanges of the edges into the steel case 31, and fastened directly in the steel case with machine screws 33 inserted from the outside through the case and whose heads are countersunk in the case. For reception of the screws threaded holes are provided in the hinge leaves on the related side of the hinges. The hinge leaves on the door are fastened in specially devised fastening irons 34, which may be fastened to an extra reinforcing bar 35, or to the reinforcing bar 3 which runs along the door rail, arranged at a suitable distance from the door post. The hinges are then to be fastened to the iron 34, and the edging 11 by means of machine screws 36 inserted through this and the hinge leaf or plate 30, for whose reception threaded holes 37 are arranged in the fastening iron 34.

Advantages of slotting the hinge leaves at several places and arranging these on the edgings inside of the steel cases are that weakening of the edging and of the door post by a disproportionately long slot is avoided, which would be present with an undivided hinge leaf, and that

the edging and the door post can present plane surfaces to each other.

What I claim as my invention is:

1. A reinforced door or the like comprising two spaced outer panels each consisting of a wood or the like body of substantial thickness and a sheet metal plate substantially covering the inner surface of at least one of said outer panels, spacer bars arranged between the outer panels at substantially spaced intervals, said spacer bars being flat and arranged transversely with their edges abutting the panels, the edges of the spacer bars having teeth piercing the metal plate and embedded in the wood body of the panel, plates of insulating material covering the inner sides of the panels between adjacent spacer bars, said insulating material plates being spaced from each other in the direction of the thickness of the door or the like, and expanding means positioned between the insulating material plates and resiliently holding them against the inner sides of the outer panels.

2. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, a non-metallic insulating plate arranged against the inner side of said outer panels, at least one of said outer panels comprising a metal plate on its inner side, with the outer side of the corresponding insulating plate engaged therewith and with the teeth of the spacer bars thrust through the metal plate.

3. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, a non-metallic insulating plate arranged behind each of said outer panels, at least one of said outer panels comprising a metal plate positioned along the outer side of the corresponding insulating plate with the teeth of the spacer bars thrust through the metal plate, said metal plate being otherwise substantially imperforate.

4. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, a non-metallic insulating plate arranged behind each of said outer panels, at least one of said outer panels comprising a metal plate positioned along the outer side of the corresponding insulating plate with the teeth of the bars thrust through the metal plate, said metal plate being foraminous.

5. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their

edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, a non-metallic insulating plate arranged behind each of said outer panels, and a metal plate positioned between each outer panel and the related insulating plate with the teeth of the spacer bars penetrating the metal plates, and expanding means positioned between the insulating plates.

6. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, a non-metallic insulating plate arranged behind each of said outer panels, a metal plate positioned between each outer panel and the related insulating plate with the teeth of the spacer bars penetrating the metal plates, and expanding means positioned between the insulating plates, at least one of said metal plates being otherwise substantially imperforate.

7. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, a non-metallic insulating plate arranged behind each of said outer panels, a metal plate positioned between each outer panel and the related insulating plate with the teeth of the spacer bars passing through the metal plates into the outer panels, and expanding means positioned between the insulating plates, at least one of said metal plates being foraminous.

8. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, a non-metallic insulating plate arranged behind each of said outer panels, a metal plate positioned between each outer panel and the related insulating plate with the teeth of the spacer bars passing through the metal plates and into the outer panels, and expanding means positioned between the insulating plates, one of said metal plates being otherwise imperforate and the other foraminous.

9. A reinforced door or the like comprising a pair of spaced outer panels, a plurality of spacer bars arranged between the panels at intervals and extending for substantial linear distances across the panels, said spacer bars being substantially straight and flat and arranged with their edges abutting the inner sides of said outer panels, the said edges being formed with teeth securably embedded in the panels, one of the outer panels comprising a substantially imperforate metal plate backed by a non-metallic insulating plate, with the teeth on the related edge of the spacer bars securably penetrating the metal plate.

JOHANNES BRYNJÖLVSEN EEN.

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